REMARKS:

Claims 1-20 are pending. Claims 1, 2, and 3 have been amended to correct for formalities including grammatical errors and antecedent basis. New claims 4-20 have been added. Support for new claims 4 and 19 is found, *inter alia,* in the specification on page 5, lines 22-25, page 9, line 25, to page 10, line 5, and Fig. 1. Support for new claim 5 is found, *inter alia,* in the specification on page 10, lines 5 and 25-27. Support for new claim 6 is found, *inter alia,* in the specification on page 5, lines 23-25, page 10, lines 15-18, and Fig. 1. Support for new claim 7 is found, *inter alia,* in the specification on page 5, line 26, to page 6, line 24, and Fig. 1. Support for new claim 8 is found, *inter alia,* in the specification on page 5, line 26, to page 6, line 5. Support for new claim 9 is found, *inter alia,* in the specification on page 6, lines 19-24, and Fig. 1. Support for new claim 10 is found, *inter alia,* in the specification on page 7, line 27, to page 8, line 2. Support for new claim 11 is found, *inter alia,* in the specification on page 8, line 21, to page 9, line 8. Support for new claim 12 is found, *inter alia,* in the specification on page 9, lines 13-15. Support for new claim 13 is found, *inter alia,* in the specification on page 10, lines 6-8. Support for new claim 14 is found, *inter alia,* in the specification on page 10, lines 8-9. Support for new claim 15 is found, *inter alia,* in the specification on page 6, lines 6-24, and Fig. 1. Support for new claims 16 and 20 is found, *inter alia,* in originally filed claim 1. Support for new claims 17 and 18 is found, *inter alia,* in the originally filed claims 2 and 3, respectively. Applicants have amended the specification to correct for grammatical and typographical errors. Applicants have amended the Summary Of The Invention section of the specification to reflect the amendments to claim 1 and the addition of claims 16 and 20. Applicant has amended the Abstract Of The Disclosure section to reflect new claim 16. No new matter has been added. Reexamination and reconsideration of the application, as amended, are respectfully requested.

On pages 2-4 of the Office Action, the Examiner rejects claims 1 and 3 under 35 U.S.C. § 103(a) as being unpatentable over Koga et al. (USP 5,970,390) in view of Koike (USP 6,246,864). Also, on page 4 of the Office Action, the Examiner rejects claim 2 under 35 U.S.C. § 103(a) as being unpatentable over Koga in view of Koike and further in view of Meador et al. (USP 5,953,640). A prima facie obviousness rejection requires that the prior art reference, or references, when combined, must teach all of the claim limitations. MPEP § 2143.03; In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d (BNA) 1596 (Fed. Cir. 1988). Applicant respectfully traverses these rejections.

Claim 1 recites a frequency modulating (FM) transmitter, including a reference frequency generator, a reference frequency divider, a stereo modulation circuit, an oscillator circuit, a program counter, and a PLL frequency synthesizer. The reference frequency generator is for generating a reference frequency. The reference frequency divider is for frequency dividing the reference frequency. The stereo modulation circuit is for frequency modulating a right audio signal and a left audio signal by using one output of the reference frequency divider to supply resultant stereo modulated signals as FM signals. The oscillator circuit is for generating carrier waves to transmit the FM signals received from the stereo modulation circuit. The program counter is for frequency dividing the carrier waves into variable frequency components. The PLL frequency synthesizer has a phase comparator circuit for comparing the variable frequency components output from the program counter with another output of the reference frequency divider to provide at an output end of the PLL frequency synthesizer a control signal for controlling the oscillator circuit.

Claim 16 recites a frequency modulating (FM) transmitter, including a reference frequency generator, a reference frequency divider, a stereo modulation circuit, an oscillator circuit, a program counter, and a PLL frequency synthesizer.

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The reference frequency generator is for generating a reference frequency. The reference frequency divider is for frequency dividing the reference frequency. The stereo modulation circuit is for frequency modulating audio signals by using one output of the reference frequency divider to supply resultant stereo modulated signals as FM signals. The oscillator circuit is for generating carrier waves to transmit the FM signals. The program counter is for frequency dividing the carrier waves into variable frequency components. The PLL frequency synthesizer has a phase comparator circuit for comparing the variable frequency components output from the program counter with another output of the reference frequency divider.

Claim 20 recites a method of generating an FM signal, including generating a reference frequency, dividing the reference frequency using a reference frequency divider, frequency modulating a right audio signal and a left audio signal using one output of the reference frequency divider to supply FM signals, generating carrier waves to transmit the FM signals using an oscillator circuit, dividing the carrier waves into variable frequency components, and comparing the variable frequency components with another output of the reference frequency divider using a phase comparator circuit in a PLL frequency synthesizer.

Applicant submits that independent claims 1, 16, and 20 are patentable because neither Koga, Koike, nor Meador teach or suggest, "a stereo modulation circuit for frequency modulating . . . by using *one output of said reference frequency divider* to supply resultant stereo modulated signals as FM signals . . . and a PLL frequency synthesizer which has a phase comparator circuit for comparing said variable frequency components output from said program counter with *another output of said reference frequency divider* . . . ," as required by claims 1 and 16, or, " frequency modulating . . . using *one output of said reference frequency divider* to supply FM signals . . . and comparing said variable frequency components with *another output of said reference frequency divider* . . . ," as required by claim 20

(emphasis added). Accordingly, no combination of the teachings of the cited references can possibly result in the present claimed invention.

Koga discusses an FM stereo transmitter in combination with an FM stereo receiver. The receiver detects unused frequency within the FM broadcasting band and sets the transmission frequency to an unused frequency. In column 3, lines 27-44, Koga states:

> The stereophonic multiplexing circuit 44 converts the right/left-channel audio signals R/L supplied from the plug 42 into the stereophonic multiplex signals having the same specification as that of the presently available FM broadcasting system.
>
> Furthermore, FM modulating circuit 45 converts the stereophonic multiplex signal derived from the multiplexing circuit 44 into the FM signal having the same specification as that of the presently available FM broadcasting system, and then supplies this converted FM signal to the antenna 46. As a consequence, although not shown in this drawing, the FM modulating circuit 45 is arranged with a PLL (phase-locked loop) circuit. Since the stereophonic multiplex signal is supplied to a <u>VCO (voltage-controlled oscillator) of this PLL circuit</u>, the FM modulation can be realized. Furthermore, a frequency dividing ratio of a variable frequency dividing circuit employed in this PLL circuit is varied, so that the transmission frequency can be varied.

(Emphasis added). Therefore, in Koga, the stereophonic multiplexing circuit and the PLL circuit utilize separate oscillation sources. Koga does not teach or suggest, "a stereo modulation circuit for frequency modulating . . . by using *one output of said reference frequency divider* to supply resultant stereo modulated signals as FM signals . . . and a PLL frequency synthesizer which has a phase comparator circuit for comparing said variable frequency components output from said program counter with *another output of said reference frequency divider* . . . ," or, " frequency modulating . . . using *one output of said reference frequency divider* to supply FM

signals . . . and comparing said variable frequency components with *another output of said reference frequency divider* . . . ." (Emphasis added).

On page 3 of the Office Action, the Examiner cites Koike merely for disclosing, "a PLL with a phase comparator . . . for comparing outputs of the program counter . . . and the reference divider . . . ." Koike discusses a wireless microphone use UHF band carrier FM transmitter that includes a PLL system. However, Koike makes no mention of, "a stereo modulation circuit for frequency modulating . . . by using *one output of said reference frequency divider* to supply resultant stereo modulated signals as FM signals . . . and a PLL frequency synthesizer which has a phase comparator circuit for comparing said variable frequency components output from said program counter with *another output of said reference frequency divider* . . . ," or, " frequency modulating . . . using *one output of said reference frequency divider* to supply FM signals . . . and comparing said variable frequency components with *another output of said reference frequency divider* . . . ." (Emphasis added).

Meador discusses a single-chip transceiver, and is cited, on page 4 of the Office Action, by the Examiner for merely showing that, "the modulator having modulation level adjusted is well known in the art . . . ." However, Meador makes no mention of, "a stereo modulation circuit for frequency modulating . . . by using *one output of said reference frequency divider* to supply resultant stereo modulated signals as FM signals . . . and a PLL frequency synthesizer which has a phase comparator circuit for comparing said variable frequency components output from said program counter with *another output of said reference frequency divider* . . . ," or, " frequency modulating . . . using *one output of said reference frequency divider* to supply FM signals . . . and comparing said variable frequency components with *another output of said reference frequency divider* . . . ." (Emphasis added).

Accordingly, applicant submits that neither Koga, Koike, nor Meador individually, nor in combination, teach or suggest all of the requirements of independent claims 1, 16, and 20. Therefore, independent claims 1, 16, and 20, and depending claims 2-15 and 17-19, are patentable over Koga in view of Koike, and further in view of Meador.

The art made of record but not relied upon by the Examiner has been considered. However, it is submitted that this art neither describes nor suggests the presently claimed invention.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (213) 337-6700 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,
HOGAN & HARTSON L.L.P.

Date: August 14, 2002

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Version with Markings to Show Changes Made

In the specification:

Page 3, line 25, through page 5, line 12, the section of the specification entitled SUMMARY OF THE INVENTION:

SUMMARY OF THE INVENTION

[In view of the prior art drawbacks as mentioned above, it is therefore an object of the invention to provide an economic and compact FM transmitter using a minimum number of elements such as a quartz oscillator.

]In accordance with one aspect of the invention, a frequency modulating (FM) transmitter[, comprising] includes:

a reference frequency generator for generating a reference frequency;

a reference frequency divider for frequency dividing [said]the reference frequency;

a stereo modulation circuit for frequency modulating a right audio signal and a left audio [signals (stereo modulating)]signal by using one [of the frequencies obtained in said]output of the reference frequency divider [and for supplying the]to supply resultant [signals]stereo modulated signals as FM radio signals;

an oscillator circuit for generating carrier waves to transmit [said]the FM signals received from [said]the stereo modulation circuit;

a program counter for frequency dividing [said]the carrier waves into variable frequency components; and

a PLL frequency synthesizer which has a phase comparator circuit for comparing [the output of said]the variable frequency components output from the program counter with another output of [said]the reference frequency divider to provide at [its]an output end of the PLL frequency synthesizer a control signal for controlling [said]the oscillator circuit.

In this arrangement, since the FM transmitter may generate various frequency signals for both the stereo modulation and frequency comparison in the PLL frequency synthesizer by means of a single oscillator, the resulting FM transmitter has most of the elements integrated in one chip, which implies that the transmitter has far smaller dimensions and a simpler structure in number and arrangement of elements than conventional transmitters, and hence offers increased reliability and [less]reduced manufacturing cost. Further, the program counter may be constructed such that the frequency division ratios of the program counter and the modulation level of the stereo modulator circuit are controllable by external means. It is then possible to vary the carrier frequency of the FM transmission wave as needed and to set the FM modulation at a characteristically optimum level.

The frequency of the reference frequency generator may be chosen to be 7.6 MHz or an integral multiple or fractional frequencies of 7.6 MHz obtained by dividing 7.6 MHz by integers (hereinafter referred to as integer fractions). It should be noted that this choice of the fundamental frequency allows provision of not only commonly used 38 kHz and 19 kHz stereo modulation frequencies through the frequency divisions but also FM radio frequencies which are close to conventional frequencies by the same quartz oscillator.

In accordance with another aspect of the invention, a frequency modulating (FM) transmitter includes:

a reference frequency generator for generating a reference frequency;

a reference frequency divider for frequency dividing the reference frequency;

a stereo modulation circuit for frequency modulating audio signals by using one output of the reference frequency divider to supply resultant stereo modulated signals as FM signals;

an oscillator circuit for generating carrier waves to transmit the FM signals;

a program counter for frequency dividing the carrier waves into variable frequency components; and

a PLL frequency synthesizer which has a phase comparator circuit for comparing the variable frequency components output from the program counter with another output of the reference frequency divider.

In accordance with another aspect of the invention, a method of generating an FM signal includes:

generating a reference frequency;

dividing the reference frequency using a reference frequency divider;

frequency modulating a right audio signal and a left audio signal using one output of the reference frequency divider to supply FM signals;

generating carrier waves to transmit the FM signals using an oscillator circuit;

dividing the carrier waves into variable frequency components; and

comparing the variable frequency components with another output of the reference frequency divider using a phase comparator circuit in a PLL frequency synthesizer.

Page 10, lines 3-9:

In the FM transmitter of the invention, all the components except for the quartz oscillator Xosc and the modulation elements, are integrated in a single semiconductor [tip]chip. The [tip]chip may be formed by BiCMOS processes. Analog signal processor sections 50 and 60, stereo modulation section 70, FM circuit 90, and RF amplifiers 102 and 103 may be provided in the form of bipolar circuits. PLL frequency synthesizer 80, which is a digital or pulse signal processor, and shift register 101 may be CMOS circuits.

Page 13, lines 1-17, the section of the specification entitled ABSTRACT OF THE DISCLOSURE:

ABSTRACT OF THE DISCLOSURE

[An FM transmitter includes: an oscillation circuit for FM radio transmission; a stereo modulation circuit for modulating a right and a left audio signals and outputting a control signal for controlling the oscillation circuit; a program counter for frequency dividing the output of the oscillation circuit into variable frequencies; a reference frequency divider for dividing 7.6 MHz reference frequency (or an integral multiple of 7.6 MHz); and a PLL frequency synthesizer having a phase comparator for comparing the phases of the outputs of the program counter and of the reference frequency divider to generate a control signal for controlling the oscillation circuit. The stereo modulation circuit is adapted to perform frequency modulation using a clock signal generated by the reference frequency divider. The transmitter has only one quartz oscillator and a greatly reduced number of elements, so that it can be provided in a very compact form at a low manufacturing cost.]A frequency modulating (FM) transmitter includes a reference frequency generator, a reference frequency divider, a stereo modulation circuit, an oscillator circuit, a program counter, and a PLL frequency synthesizer. The reference frequency generator is for generating a reference frequency. The reference frequency divider is for frequency dividing the reference frequency. The stereo modulation circuit is for frequency modulating audio signals by using one output of the reference frequency divider to supply resultant stereo modulated signals as FM signals. The oscillator circuit is for generating carrier waves to transmit the FM signals. The program counter is for frequency dividing the carrier waves into variable frequency components. The PLL frequency synthesizer has a phase comparator circuit for comparing the variable frequency components output from the program counter with another output of the reference frequency divider.

In the claims:

1. (Amended) A frequency modulating (FM) transmitter, comprising:

a reference frequency generator for generating a reference frequency;

a reference frequency divider for frequency dividing said reference frequency;

a stereo modulation circuit for frequency modulating a right audio signal and a left audio [signals (stereo modulating)]signal by using one output of said reference frequency divider to supply [the]resultant [signals]stereo modulated signals as FM signals;

an oscillator circuit for generating carrier waves to transmit said FM signals received from said stereo modulation circuit;

a program counter for frequency dividing said carrier waves into variable frequency components; and

a PLL frequency synthesizer which has a phase comparator circuit for comparing [the output of]said variable frequency components output from said program counter with another output of said reference frequency divider to provide at [its]an output end of said PLL frequency synthesizer a control signal for controlling said oscillator circuit.

2. (Amended) The FM transmitter [as claimed in]according to claim 1, wherein [the]frequency division ratios of said program counter and [the]modulation level of said stereo modulation circuit are externally controllable.

3. (Amended) The FM transmitter [as claimed in]according to claim 1, wherein [the]said reference frequency [of]from said reference frequency generator is [set to either one]selected from the group consisting of 7.6 MHz, an integral multiple of 7.6 MHz, [or]and integer fractions of 7.6 MHz.